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LÅNGBAN AND ITS MINERALS*

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In the Province of Värmland (= Wermland), at the north-east corner of Lake Vänern (= Wenner), the largest inland lake in Sweden, lies the town of Kristinehamn (= Christinehamn). Fifty-three kilometers distant in a northerly direction is the town Filipstad, which is the most suitable starting-point for a visit to the Swedish manganese mines which have acquired an international reputation from a mineralogical standpoint, viz., Nordmark with Jakobsberg, Långban and Pajsberg with Harstigen. The Nordmark area lies about fifteen kilometers north of Filipstad, and Långban twenty kilometers NNE of the town. Both of these areas may be reached by rail. To reach the Pajsberg area, which lies ten kilometers NE of Filipstad, it is necessary to go by motor car from Persberg station or by boat across Lake Yngen.

There is, however, no object for mineralogists to visit the two outer areas, Nordmark and Pajsberg, as no minerals have been found there for more than thirty years. At Pajsberg—including Harstigen—operations were definitely abandoned in the middle of the nineties, as the small existing quantities of manganese ore then seemed to be exhausted. Such was also the case at Jakobsberg, though there a fresh attempt was made, but the results were not very encouraging. The mines at Nordmark are still being worked, but only for iron ore, and at the present time no minerals of unusual interest have been discovered. While the two extreme links in the chain of the Värmland workings—

* We are herewith publishing the first of a new series of articles on famous mineral localities. From time to time we hope to print others describing mineral occurrences at Binnenthal, Laurion, Mt. Vesuvius, the Kola Peninsula, Casapalca and the French Creek Mines. Those promising to prepare manuscripts include Messrs. F. N. Ashcroft, H. S. Washington, A. Pelloux, A. E. Fersmann, Hugh E. McKinstry and George Vaux, Jr.

It has even been suggested that with the low third class tourist rates offered by steamship companies some of the more active mineralogical clubs might consider seriously trips to a number of these famous foreign localities. *The Editor.*

Pajsberg-Harstigen in the extreme southeast and Nordmark-Jakobsberg in the northwest—have thus fallen into the background, the central one, Långban, has advanced to an important position, which is probably without parallel.

The ores of the Långban mines lie imbedded in a dolomite field, whose length in a direction from north to south is three kilometers and its maximum breadth about nine hundred meters. It is surrounded by leptite (=granulite) and granite, together with some diorite and diabase. Only in the immediate vicinity of the ores, especially on their under-side, is the dolomite pure. Otherwise it is mixed with calcium and magnesium silicates, mostly actinolite, which is sometimes altered to serpentine. Only a small part of the dolomite area, about fifteen hectares, is ore-bearing. Here the ore forms stocks or masses, which have no great extension above-ground, but below the surface may attain a length and breadth of one hundred meters and forty meters, respectively, with considerable thickness. Each body of ore of any size contains iron and manganese ores in about equal proportions, but each type of ore is distinctly separated so that we are not in the presence of manganese-bearing iron ores or iron-bearing manganese ores. Individualization has proceeded so far that it is only in exceptional cases that the two types of ores are in contact. As a rule they are separated by layers of dolomite or leptite. In spite of this striking separation, it happens at times, that outcrops of one type of ore extend into the other, and it is often in connection with such outcrops that the most characteristic minerals are encountered.

The iron ores consist of both hematite and magnetite, the latter in much smaller amounts—about one-fifth of the total. The hematite is finegrained, sometimes schistose, and is generally quite pure. The magnetite is usually coarse-grained or dense and appears for the most part as an envelope enclosing the hematite masses. The manganese minerals, also, are of two types, hausmannite and braunite, of which the former is to be regarded as the principal ore. It generally forms isolated grains or crystals more or less closely grouped in the dolomite. The braunite, on the other hand, generally occurs in compact masses. These, however, are comprised, especially in the case of ores recently collected, of an intimate mixture of the two minerals. Small portions may consist of hausmannite alone, but braunite has not been observed alone.

MINERALS FROM LÅNGBAN, SWEDEN

Akrochordite (a)	Långbanite (a)
Allactite (b)	Lead
Allanite	
Amphibole	Magnetite
Apophyllite	Magnetoplumbite (a)
Aragonite	Malachite
Armangite (a)	Manganosite
Atopite (a)	Mangan-vesuvianite (b)
Azurite	Margarosanite
	Melanotekite (b)
Bäckströmite (a)	Micas
Barite	Molybdenite
Barylite (a)	Molybdophyllite
Barysilite (b)	
Berzeliite (a)	Nasonite
Bismuth	Ochrolite (b)
Bornite	
Braunite	Pectolite
Bromellite (a)	Periclase
	Pinakiolite (a)
Calcite	Pyrite
Chalcocite	Pyroaurite (a)
Chalcopyrite	Pyrobelonite (a)
Chlorite	Pyrochroite
Copper	Pryoxene
Dixenite (a)	Quartz
Ekdemite (b)	Quenselite (a)
Epidote	Realgar
	Rhodonite
Feldspar	
Finnemanite (a)	Sarkinite (b)
Fluorite	Scheelite
	Silver
Galena	Sphalerite
Ganomalite (b)	Sphenomanganite (a)
Garnet	Svabite (b)
	Swedenborgite (a)
Hausmannite	
Hedyphane	Talc
Hematite	Tephroite
Hisingerite	Thaumasite
Hyalotekite	Tilasite (a)
Hydrocerussite	Trigonite (a)
	Trimerite (b)
Inesite	
Karyinite (a)	Weslienite (a)
Kentrolite	

Up to the present time all the minerals found at Långban have been divided into two classes, viz., (A) those that may be considered as being fairly well established, and have received a name and place in the determinative system; and (B) those whose present known properties are limited to the knowledge gained by a more or less superficial examination. These latter are indicated by numbers in a special collection of types.

The names of those under class (A) are given above, those that have been found only at Långban being indicated by "a," and those which have also been found in other Värmland occurrences, but not elsewhere, being indicated by "b."

These eighty-one independent minerals have been found within an area of fifteen hectares and in mines in which only one attains a depth of a hundred and eighty five meters. About a quarter of them (twenty one) are found only there, and an additional twelve in other Värmland manganese mines. Can this be paralleled elsewhere?

But the picture of the mineral wealth of Långban which is gained merely from a consideration of the minerals comprising class (A) is by no means complete, however closely it may seem to approach a record. On the contrary, it shrinks into insignificance in comparison with the minerals of class (B), for at the Stockholm Höghskola there is a collection of 412 numbers, and at Riksmuseet another of 24, making in all 436 types. It is true that of these 13 have lately been examined and therefore are not to be counted among the numbers of class (B). But there remain 423 unknown minerals awaiting examination. These figures speak for themselves.

All the minerals belonging to class (B), with the exception of those at Riksmuseet, which are of a somewhat older date, have been collected within the last ten years, and as there is no reason to believe that the occurrences formerly were less numerous than now, we can obtain some idea of the number of minerals that have escaped detection during the centuries that the mines have been worked at Långban. The intense collecting activity that prevails at the present time is due to two reasons; in the first place, and naturally, to a greater knowledge and alertness on the part of those who come in contact with the products of the mines (the capacity to use the simpler instruments, such as the magnifying glass etc.), and in the second place, to the absence of

restrictions, so that the collector retains his finds and has them at his disposal. Formerly at Långban, as at other places, it was thought to be to the interest of science to decree that everything found should be disclosed to the authorities. But the zeal for collecting was thereby dampened.

In enumerating the list of minerals there have been included only those types individualized by crystallization or those whose homogeneity was beyond all doubt. Nevertheless, it is possible that, upon closer examination, a number here listed will be found whose claim to independence may be questioned. But there will certainly not be many such cases. Among the Långban minerals, too,—even when they are regarded as *known*—there are a great variety of types and development of forms. Thus at Riksmuseet there is a collection of at least fifteen distinct types of crystals of barite from Långban. Something similar is met with in the case of many other common minerals, such as pyroxenes, amphiboles, garnets, calcite, etc.

A considerable number—about one-third—of the unknown minerals are found in such small quantities that a regular and complete examination will not be possible. But everything new, however insignificant, has been collected, for that which on one occasion may present itself very sparingly, on another occasion may be found abundantly, and at Långban mineralogical surprises are the order of the day.

The elements which predominate in the composition of the rare Långban minerals are Mn, Pb, Ba, As and Sb. Besides, it is worthy of note, that lead in its native state occurs in considerable quantities, and arsenic and antimony are present in their lower forms of oxidation. Further, it is noteworthy that traces of phosphorus can not be found in these mines.

APPLICATIONS OF COLLOID CHEMISTRY
TO MINERALOGY
PART II. STUDIES OF CRYSTAL GROWTH IN
SILICA GEL

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In a preliminary report¹ the authors discussed the value of silica gel as a medium for the growth of crystals, and presented the results obtained in preliminary trials with lead and mercuric iodides and calcium carbonate. In the present paper the results are given of further studies of lead iodide.

Although the method of procedure was described in the previous paper a brief review of this point seems desirable. The silica gel used was formed by a mixture of aqueous Na_2SiO_3 (1.062 sp.gr.) with varying amounts of N/1 CH_3COOH . Equal volumes of silicate and acid give a gel of decidedly acid reaction; neutrality is approached only when approximately two volumes of silicate are used to one of acid. The crystals were prepared by chemical reaction of two reagents (e.g. lead acetate and sodium iodide for the lead iodide) one of which was incorporated in the gel before the latter had set, the other being poured over the top of the hardened gel. The latter reagent diffusing downward causes slow formation of crystalline material. Ordinary six inch test tubes were used as containers.

A rather complete study of the lead iodide crystals formed in gels under varying conditions of acidity, concentrations, etc., has been completed and some interesting data obtained. Five separate series each consisting of eleven tubes were prepared in

Series A. 10 cc. of sodium silicate.

10 to 6 cc. of N/1 acetic acid to form gel.

1 cc. N/1 $\text{Pb}(\text{Ac})_2$ in gel.

10 cc. N/1 NaI "floated" on gel.

Series B. Same as A but KI substituted for NaI .

Series C. Same as A. but concentration of $\text{Pb}(\text{Ac})_2$ halved.

Series D. Same as A but $\text{Pb}(\text{NO}_3)_2$ used in gel in place of $\text{Pb}(\text{Ac})_2$.

Series E. 10 cc. of sodium silicate in gel.

1 cc. 3N. NaI in gel.

10 cc. saturated $\text{Pb}(\text{Ac})_2$ "floated" on gel.

NOTE: Acetic acid varied in each series from 10cc. to 6 cc. by steps of 0.4 cc.

¹ L. W. Fisher and F. L. Simons; Applications of Colloid Chemistry to Mineralogy. Part I. Preliminary Report. *Am. Mineral.*, **11**, 124—130 (1926).

order to study the effects of both acidity and concentration on the crystals formed.

RATE OF GROWTH

Fibrous forms of lead iodide discussed in the preliminary report are predominant in the more acid members of the series—A, B and C. The rate of growth of the fibers is rather uniform and is not visibly affected by the degree of acidity in any individual series. In every tube the average growth in one day is one centimeter, this rate decreasing until one of the reagents is exhausted. In this study and in the preliminary work it seems then that acidity has no effect on the rate of growth of the crystals.

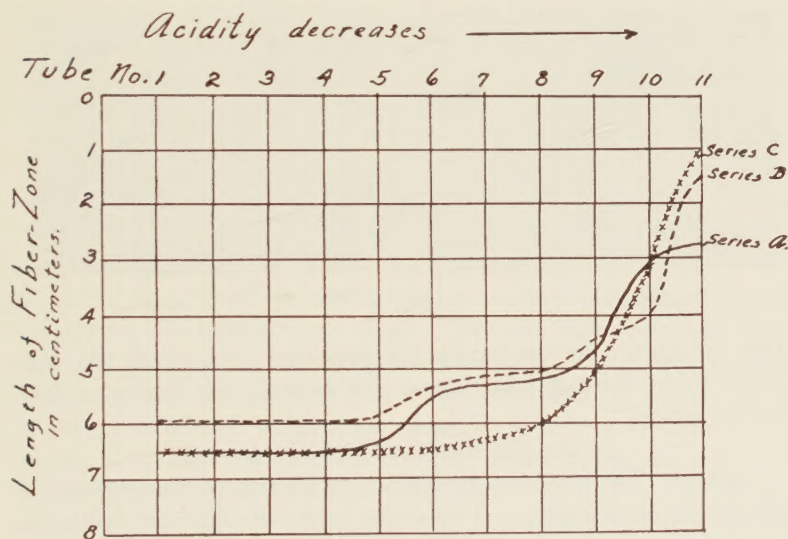


Fig. 1. Curve showing rate of growth of the fibrous zone.

In the more acid members of each of the three series under discussion the fibers grew to a depth of 6.5 cm., the longest individual fiber reaching an overall length of 6 cm. The depth of growth, that is, the length of the fibrous zone, decreases as the acidity decreases. Interesting data on the length of the fibrous zone were obtained by varying the floating reagent and decreasing the concentration of the reagent in the gel. In series A, as shown in the accompanying graph, figure 1, the fibrous growth shortens abruptly between the 9th and 10th members of the series, whereas the decrease was more abrupt in B when KI was used between the

10th and 11th members. In C the concentration of lead acetate was cut down in the gel and the fibrous zone decreases gradually beyond the 8th member. These data indicate that the concentration of the solution within the gel and the type of reagent floated exert an influence on the rate of growth of the crystals.

The hexagonal crystals which formed in plates and accompanied the fibrous growths show these same effects. Plates are abundant in A until the middle of the series is approached and then there is an abrupt decrease. This decrease is more pronounced near the end of series B. Thus it would be indicated that with KI used as a floating reagent the plates are more persistent in the neutral end of the series than they are when NaI was floated on the gel. When $\text{Pb}(\text{NO}_3)_2$ was incorporated in the gel in place of lead ace-

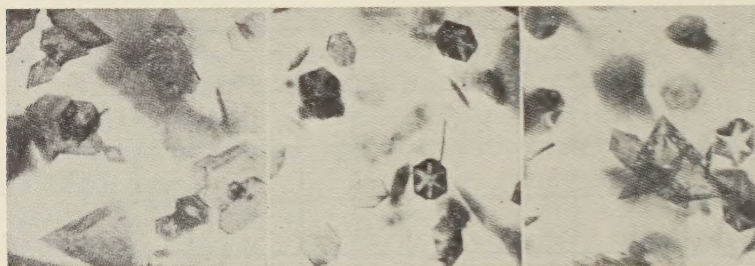


Fig. 2

Fig. 3

Fig. 4

tate the plates persist farther through the series and are seen in all tubes although they are in the minority in the latter half of the series.

A DISCUSSION OF THE FORMS

Series A: The first nine members of the series are predominantly fibrous in their forms. The more acid members of the series show strong development of hexagonal plates to tube 7 when they drop off rather abruptly, and bundle, twin or simple crystal forms of double salts ($\text{Pb}(\text{Ac})_2$, PbI_2) are formed.

The fibrous forms are typically fern-like and show a growth of from 2 to 2.3 cm. during the first day and then grow at the rate of about a centimeter a day. They tend toward spearheaded terminations throughout. In the acid end of the series some small trigonal plates are noted but these are decidedly in the minority. All through this series there seems to be a tendency toward the formation of trigonal forms although they never become abundant. The plates in this series are not usually radially or zonally marked.

Fig. 2 (left center) shows the characteristic spearhead fiber along with some simple hexagonal plates, not marked radially, and one large trigonal form.

The double salt first develops in the middle member of the series and from this point to the end of the series its forms predominate over the simple hexagonal and fibrous forms of simple lead iodide.

Series B: No pronounced difference exists in the development of forms in this and the preceding series. One or two exceptions to this might be stated. The fibers in this series are for the most part less divergent than those of A, and are quite simple in their development. Trigonal forms are a bit more common but are not in the majority. The fibrous growth stops more abruptly in the neutral end of the series than it does in A.

A bundle growth of the pale yellow double salt was noted in the middle member of this series in approximately the same position as in A. Some small truncated trigonal forms were seen in the second member, and these, too, correspond to their position in series A.

Series C: The fibers again assume more divergent properties analogous to those already cited. They are quite broad in their general development grading off gradually into short, stubby fibers toward the neutral end. The gradation in this series is more gradual and progressive than in either of the preceding series. No tube in this series shows as many hexagonal plates or trigonal forms as its corresponding member in the other series. The development of the double salt is perhaps stronger in the last three members than in the preceding series. Trigonal forms are somewhat more abundant in the early members of the series than in the latter.

Series D: In this series lead nitrate was used in the gel in place of lead acetate and a radically different development of forms was noted. This may be due to one or more of several causes, e.g.—(1) the fact that NaNO_3 is present; (2) the different solubility of lead nitrate; and, (3) the different degree of ionization of lead nitrate.

The trigonal forms which were previously indicated by the spearhead terminations of the fibrous forms and also by scattered plates throughout the first three series now become more predominant. Scattered fibers are seen in the first members of the series but they are never as prominent in this series as noted

previously. They do not attain the length of those in series A, B and C but their terminations are similar to those shown in figure 2 and are, in the main, trigonal, with some hexagonal plates attached.

The first tube of the series shows the best development of fibers and with them are associated plates usually radially or zonally marked, and some scattered trigonal plates. An excellent example of the radially marked plate is seen in figure 3 where it is associated with other plates, both plain and radial. Figure 4 shows another type of a radially marked plate along with a trigonal form grown through a hexagonal plate. As the acidity of the series is decreased the plates become more numerous until the 5th tube is reached when they attain their maximum development. The best trigonal types were noted in this tube and are shown in figures 5 and 6. The field in figure 5 shows a trigonal plate



Fig. 5

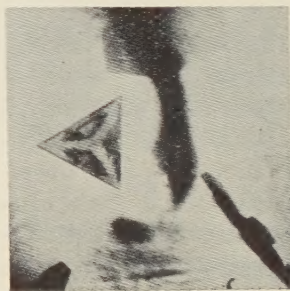


Fig. 6

overlying a hexagonal plate and also a radially marked hexagon. In figure 6 the radially marked trigonal form which is quite abundant is shown along with a large, plain hexagonal plate.

In this tube transitional forms between the normal hexagonal and trigonal were noted. A number of crystals were combinations of the rhombohedron cut by a basal pinacoid and some hexagonal prisms cut by rhombohedron and basal pinacoid. These forms are, however, not in the majority. The fibers except in the acid members of the series never extend below the second days' growth. The trigonal forms decrease decidedly when the neutral end of the series is approached but maintain their development throughout the entire series.

The double salt does not appear in this series until the last two members are reached and then the forms differ from those pre-

viously studied in that they are generally monoclinic prismatic forms with scarcely no bundle types noted. In these two tubes the double salt is strongly predominant over the simple crystals of the hexagonal and trigonal types.

From a study of the interference figures of radially marked plates as shown in figure 3 it seems possible that these types are made up of six trigonal prisms and are not normal hexagonal types. Radially marked trigonal plates as shown in figure 6 show perfect basalt section figures. All the types of plates, trigonal or hexagonal, plain, radially or zonally marked are negative optically. The mean index of refraction is higher than Canada balsam.

Series E: Increasing the concentration of the NaI threefold and incorporating it in the gel and floating a saturated solution of lead acetate on the gel prevented the formation of fibers altogether. The crystallization of the double salts is more prominent and rapid and plates of hexagonal characteristics were found only in the first member of the series. They were well developed but relatively few in number.

DOUBLE SALT CRYSTALS

Bundle Types: These are made up apparently of monoclinic combinations of domes, pinacoids and prisms, and are the first forms of the double salt to appear in any series. (They are always a lemon yellow color as contrasted with the orange color of the normal lead iodide crystals). In series A and B they begin their development at approximately the same period. A6-5cm., B6-5.7cm.; A7-4.5cm., B7-4.2cm.; A8-end of second day, B8 directly below the beginning of the second day's growth; A9, first day's growth, B9, the same. (The cm. notation means the distance from the top of the gel.).

Since their development seems to be rather uniform it is seen that there is apparently no influence exerted on them by the floating reagent, for A and B differ only in this respect. In series C these forms were first noted in tube 30 which corresponds to A8 and B8.

Series E shows the forms in their strongest development and since this tube has much stronger concentration of reagents, and series C only half the concentration of A and B, the formation of the double salt is a function of the concentration of the reagents used.

Stalk-Like Forms: These forms are most abundant in the neutral end of the series except in C. They usually occur after the first indication of the double salt bundles and are not scattered throughout the tubes to any extent except when the extreme neutral end is approached. Despite the strong concentration of Series E no stalk-like forms are noted anywhere in the series.

Radial Growths: A peculiar form maintained by the double salt is first seen in small amounts in the first three series and becomes quite pronounced in series E. There is a rather strong development of simple crystals of the double salt-monoclinic prisms, pinacoids and domes, and as the acidity of the series is decreased the forms unite to produce rather thick bundles of crystals which are not the same as noted under bundle types. Later developments of cruciform and fish-tail twins are noted and in the last member of the series, thick, nodular types spread more and show radial growths of monoclinic crystals from a common center.

The crystal forms described under double salts are of doubtful value as the composition of the double salt probably varies, viz., (1) $\text{Pb}(\text{Ac})_2.\text{PbI}_2$; (2) $\text{Pb}(\text{Ac})_2.2\text{PbI}_2$; (3) $\text{Pb}(\text{Ac})_2.3\text{PbI}_2$; etc., These three compounds are known and there must be more. We are unable to state at the present time which of the double salts we are dealing with.

THE SIGNIFICANCE OF STRAIN STRUCTURE IN QUARTZ FROM DUCKTOWN, TENNESSEE

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The so-called quartz "floors" in the copper mines at Ducktown, Tennessee, have furnished specimens of transparent quartz of rock crystal quality. Aside from the clearness of the mineral, in itself unusual, it attracts attention on account of a peculiar crossed ribbon structure which it exhibits. One specimen recently examined¹ shows a surface measuring three by five centimeters in area, approximately flat and neatly engraved as if by machine work with two intersecting sets of curved ridges cutting each other at acute angles. The appearance of the area may be compared to the "engine turning" on the back of a watch, a term

¹ A specimen kindly supplied by Professor J. F. Kemp.

employed by Brewster in 1821, when making the first reference to this type of structure on record.² Figures 1 and 2 are photographs of the specimen from Ducktown showing the ridges in question in about natural size and under moderate magnification.

Sections of the glassy quartz were cut and studied by etching and optical methods in an attempt to account for the structure. Repeated etching with hydrofluoric acid failed to produce any similar features, hence, it would not seem likely that the phenomenon could be due to any process of natural etching. Optical investigation showed the presence of twinning, and also indicated strain effects within the crystal.

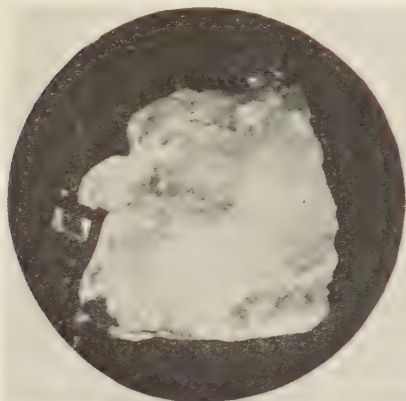


Fig. 1. Glassy quartz from Ducktown, Tennessee, showing strain structure.

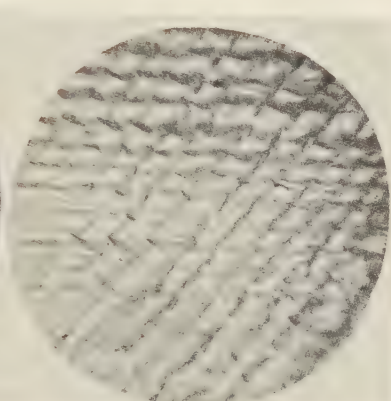


Fig. 2. The strain structure magnified about eighteen diameters.

Similar material from other localities was also studied by the same methods with confirmative results. In observing quartz specimens from different localities, the structure was found to be well developed on material having only one general type of geologic origin. All of the specimens were either pegmatitic or from recognized high temperature veins, although the largest amount of material available for study was pegmatitic. A commercial shipment consisting of a ton of large quartz crystals from Minas Geraes³, Brazil, contained several excellent examples. Although in a commercial lot of uncertain locality in Minas

² Brewster, David; On circular polarization as exhibited in the optical structure of amethyst. *Trans. Roy. Soc. Edinburgh*, Vol. 9, 139-152 (1821).

³ Examined through the courtesy of the Diamond Drill and Carbon Company, New York City.

Geraes the material was evidently of pegmatitic origin, judging from occasional included crystals of tourmaline and rutile. In addition to the Brazilian locality the structure was observed on quartz from several of our eastern pegmatites. Vom Rath⁴ and Judd⁵ described lamellae on quartz from several localities which one would suppose from their descriptions to be pegmatitic. Aside from the pegmatitic occurrences mentioned the feature was found on quartz from the cassiterite-tourmaline veins at Llallagua in Bolivia.

Search on a number of crystals from several localities of either assured or probable low temperature origin failed to reveal a sign of the structure and repeated trials of fracturing in a vise failed to produce the structure, but, on the other hand, did occasionally develop clear cleavages. The latter was particularly true in the case of the quartz from Little Falls, New York. It would seem at least possible, therefore, that the ribbon structure is limited to quartz that has crystallized at high temperatures. Although an exhaustive study would be necessary to establish the point beyond question, it seems reasonable at least to believe that the peculiar markings described can be considered as criteria for high temperature quartz from the ore-deposit standpoint, where temperatures below the inversion point are at the same time considered high temperatures.

The immediate cause of this structure has been explained by Judd⁶, who pointed out that it is due to a certain instability in quartz and that the instability becomes apparent when the quartz is fractured through the development of intersecting cleavages. After a detailed investigation he concluded that only unstable quartz would show the feature and that only after fracturing. The effect itself is given by cross fractures in twinned quartz which intersect the basal plane parallel to r and $-r$ (a magnified view is shown in figure 2). The most interesting conclusion of Judd is that the feature is subsequent to the formation of the crystal and can be reproduced at will on unstable quartz in a pressure machine.

⁴ Vom Rath, G.; *Z. f. Kryst*, **5**, 1 (1881).

⁵ Judd, John W.; Development of Lamellar Structure in Quartz Crystals by Mechanical Means. *Mineralog. Mag.*, **8**, 1-9 (1888).

⁶ Judd, John W.; Additional Notes on the Lamellar Structure of Quartz Crystals and the Methods by which it is Developed. *Mineralog. Mag.*, **10**, 123-135 (1892).

The cause of so-called "stable" and "unstable" quartz is not immediately apparent. It has been attributed by some to pressure twinning. It seems more than an accidental coincidence, however, that a number of specimens of high temperature origin show the ribbon structure and hence must be "unstable" while the low temperature specimens are "stable," and show no strain structure. If temperature can be shown to have an effect on the structure of quartz, it would seem probable that the "unstable" form represents a high temperature variety.

Recent X-ray studies leave no doubt concerning the fact that temperature affects the structure of quartz even below the inversion point of 575° C established by Mügge⁷ and Wright and Larsen.⁸ Such work carried on by Wyckoff⁹ brings out the fact that Laue Photographs taken of quartz heated to a temperature about 40° below the inversion point show a complex twinning which is cleared as soon as the inversion temperature is reached. On cooling again, the structure either may or may not reappear. It is evident, therefore, that a high temperature may be responsible for a complex structure in quartz although such a structure does not necessarily follow. Applied to the case at hand it seems possible that the "unstable" quartz may be a quartz that has been held for some time at a temperature below the inversion point and thus acquired an intimate twinning.

In view of the foregoing it is reasonable to suggest that the so-called "glassy" quartz from Ducktown, Tennessee, showing strain structure has the following explanation.¹⁰

1. The quartz is itself "unstable" as explained by Judd.
2. The "instability" is probably due to a high temperature origin although not necessarily a temperature above the inversion point.
3. The strain structure is a fracture effect, but produced only on such quartz as has been previously subjected to high temperatures.

⁷ Mügge, O.; *Neues Jahrb., Festband*, 181-196 (1907).

⁸ Wright, F. E., and Larsen, E. S; Quartz as a Geologic Thermometer. *Amer. Jour. Sci.*, **27**, 421-447, (1909).

⁹ The statement on the behavior of quartz at high temperatures as shown by Laue Photographs is based on a discussion with Dr. R. W. G. Wyckoff of the Geophysical Laboratory, who has recently worked on the structure of quartz.

¹⁰ The writer wishes to take this opportunity to thank his colleague Prof. R. J. Colony for ideas gained through critical discussion of the material contained in this article.

to epidote; locality (3) is the Gillette quarry at which many rare tourmalines were found; and at locality (4) there is a pegmatite dike so rich in lepidolite that it was once quarried as a commercial source of lithium.

It will be seen that the thulite occurs in the Middletown gneiss close to its contact with the Haddam tonalitic gneiss. The Middletown series at this point is composed of quartz-biotite schists containing amphibolitic lenses and is much granitized by pegmatitic fluids. A rather complete study of the Middletown series in southeastern Connecticut has shown that there were never very thick deposits of limestone included among its members. Such lenses as were present were almost completely transformed to amphibolites at the time of the intrusion of the tonalitic batholiths.

Occasionally small pockets of impure limestone remained. These were later brought into contact with pegmatitic fluids and were transformed to epidote. The evidence of radioactive minerals tends to show that the last transformation took place during the Devonian or Carboniferous period, 300 to 400 million years ago!¹

The thulite at Walkely Hill occurs as a band 6 to 10 inches in width interbedded with other bands of such minerals as would characterize a sedimentary gneiss derived from a calcareous sandstone. Three thin sections were cut at intervals of two to three inches across the contact between the thulite and the sandy schist. The first section nearest the schist was a typical quartz-biotite schist showing a mosaic texture composed of 60 to 70 percent of quartz, 20 to 25 percent of biotite, and 15 to 20 percent of oligoclase. The second section was composed of 70 to 80 percent of quartz, 20 to 25 percent of actinolite, and 5 to 6 percent of andesine. The optical properties of the actinolite showed that it was close to tremolite in composition. The third section showed 10 to 15 percent of quartz in large irregular fragments, 50 to 60 percent of labradorite (Ab_{35}), 25 to 30 percent of epidote and 5 to 6 percent of thulite. The presence of so basic a plagioclase in association with a lime-rich epidote and thulite leads one to suppose that the pegmatitic fluids reacted with an impure limestone to develop this abnormal grouping of minerals. The actual presence of a limestone with epidote at an adjacent locality lends support to this supposition.

It was hoped that an analysis might be made of the thulite but the epidote and the thulite are so intimately intergrown that

¹ H. V. Ellsworth, *Am. Jour. Sci.*, 9, p. 143 (1925).

it was found impossible to obtain pure material. The two minerals have almost the same middle index of refraction (approximately 1.69), are practically colorless in thin sections and hence show no pleochroism. They are most easily distinguished by their extinction angle. The thulite is orthorhombic and hence has parallel extinction; the epidote is monoclinic and extinguishes at an angle of 35° . Their optical characters differ as well. Thulite is positive and epidote is negative.

The two photomicrographs, one in plane polarized light and the other of the same area between crossed nicols, illustrate the intergrowth of the feldspar, thulite, and epidote. Between the members of the epidote group and the plagioclase feldspar there has very evidently been resorption. A study of the sections indicates that the epidote minerals were replaced by the feldspar.

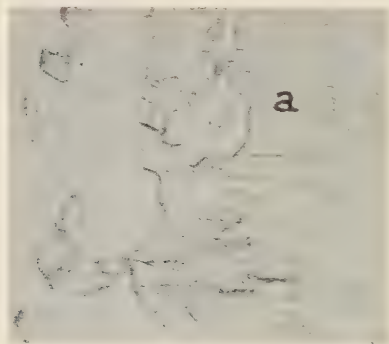


Fig. 2. Thulite and epidote
 $\times 28$

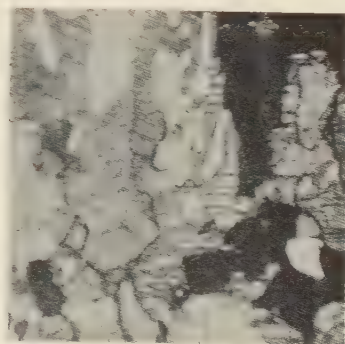


Fig. 2. Thulite and epidote
+ nicols. $\times 24$

The crystal labelled (a) in the two photographs shows the intimacy of intergrowth of the epidote and thulite. In plane polarized light the cleavage would indicate a single mineral. Yet between crossed nicols the inner portion of the crystal has a position of extinction parallel to the cleavage.

An attempt was made to obtain a fairly pure sample of the thulite. Bits of the pink mineral, 4 to 5 mm. in diameter, were picked out. They were finely powered and a separation was obtained by a heavy solution. The greater part of the powder showed a specific gravity of 3.19.

So few occurrences of thulite are reported in the United States that it was thought wise to record the facts concerning the Haddam

locality. There is a considerable amount of material available for those who would like to add it to their collections. The contrasting pink of the thulite and green of the epidote make the specimens attractive.

A description of a similar occurrence of thulite was contained in notes by John W. Lee.² The specimens he described were obtained from a gneiss quarry near Hampton, Maryland, in 1895.

A NOTE ON CYANOTRICHITE

CHARLES PALACHE AND H. E. VASSAR, *Harvard University*

Cyanotrichite is a basic copper sulphate which has been long accepted as a definite mineral species. Nevertheless, the evidence for its identity is in reality slight. On Dana's System analyses of this mineral by three authors from four localities are given which agree fairly well with one another and with the formula somewhat doubtfully proposed. But examination of the original papers from which these analyses are derived, shows that every one of them was made upon a minute amount of material which in no case had been examined optically. The two latest papers concerning this mineral¹ emphasize the need of optical data for cyanotrichite and better correlation with a reliable analysis.

In the Harvard Mineralogical Museum there is an unusually handsome specimen of cyanotrichite brought from the Grandview mine, Grand Canyon, Arizona, in 1906 by Professor J. E. Wolff. A surface of about 24 square inches is entirely covered with a dense mat of the pure blue fibres, admixed only with an occasional green crystal of brochantite. In parts of the specimen the cyanotrichite is implanted upon limonite in the most delicate and perfect spherulites, deep blue at their centers and shading to almost white at the tips of the delicate needles. It was possible to remove about half a gram of the fibres without serious injury to the specimen. This very pure material was studied optically by Professor E. S. Larsen and was analyzed by Miss Helen E. Vassar. The material is clearly identical with that studied by Rogers and Gordon in the papers cited.

² *Am. Jour. Sci.*, **11**, 171-172 (1901).

¹ Rogers, A. F. The optical properties and morphology of Bisbeeite, *Am. Mineral.*, **7**, 153 (1922).

Gordon, S. G. Recently described "bisbeeite" from the Grand Canyon is cyanotrichite, *Idem.* **8**, 92 (1923).

OPTICAL PROPERTIES: The material is strongly pleochroic. X = nearly colorless; Y = pale blue; Z = bright blue. $Z = c$; $2V = 82^\circ$ $\rho < \nu$ large. $\alpha = 1.588$; $\beta = 1.655$; $\gamma = 1.617$

CHEMICAL COMPOSITION

1. Analysis of cyanotrichite by H. E. Vassar.
2. The same recalculated to 100% after omission of unessentials.
3. Molecular ratio.

	1.	2.	3.
Al ₂ O ₃	15.59	15.85	.155 1 x .155
CuO	47.50	48.27	.606 4 x .151
SO ₃	12.19	12.38	.155 1 x .155
H ₂ O	23.20	23.50	1.305 8 x .163
Fe ₂ O ₃	0.43		
CaO	0.11		
Insoluble	1.46		
	<hr/> 100.48	<hr/> 100.00	

The ratio derived from this analysis corresponds to the formula proposed by Dana, $4\text{CuO} \cdot \text{Al}_2\text{O}_3 \cdot \text{SO}_3 \cdot 8\text{H}_2\text{O}$ with an accuracy which confirms its correctness.

We may add to this record the description given by Rogers of the crystal form of his material from the same locality. The needles are orthorhombic and are bounded by three pinacoids. The optical orientation is: $X = a$; $Y = b$; $Z = c = \text{elongation}$.

This mineral recalls an interesting point in the history of the Harvard Mineralogical Museum. The name cyanotrichite dating from 1839 takes precedence by priority over the name lettsomite, given it in 1850 by Percy. Lettsom was an English mineralogist of some note in his day, who with Greg, wrote a *Manual of the Mineralogy of Great Britain* in 1858.

An ancestor of the mineralogist, Lettsom, was William Coakley Lettsom, a physician, writer and scientist who practiced in London, aided the introduction of vaccination after Jenner's discovery and made a great fortune. Dr. Lettsom became a correspondent of Dr. Benjamin Waterhouse one of the first professors of medicine at Harvard and the first to begin a Natural History Collection there. In the Harvard archives are letters showing that a gift of minerals made by Dr. Lettsom to Waterhouse in 1793 was the very beginning of the Harvard cabinet. The writer of this note takes a quiet satisfaction in thus being able to establish firmly as a species, after so long a lapse of years, the mineral which bears the name of the first benefactor of the Harvard Museum.

PROCEEDINGS OF SOCIETIES

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences of Philadelphia, June 3, 1926.

A stated meeting of the Philadelphia Mineralogical Society, held on the above date, was called to order by President Vaux. Twenty-nine members and eight visitors were present.

The following procedure for the election of officers was suggested by the executive council, and on motion was adopted by the society:—Nominations may be made in writing by any member and placed in the hands of the secretary at any time before the adjournment of the September meeting, and additional nominations may be made from the floor. All nominations shall then be posted and the election shall be by ballot at the October meeting.

Dr. Frederick Ehrenfeld, of the University of Pennsylvania, was then introduced, and addressed the society on "*What Constitutes a Mineral Species?*" External physical properties furnished the first criteria for differentiating mineral species. Then came chemical analysis, then optical properties, and as each new method of investigation has been developed it has brought with it new differences and new similarities between minerals. At present the two most important properties which define a mineral species are chemical composition and crystalline nature. But neither of these is invariable, and consequently identification of a mineral by either alone is often unsatisfactory. The discovery of the variation in optical and crystallographic properties with the chemical composition was a great advance. But the question of "what constitutes a mineral species" is still unanswered. Strictly speaking, a mineral is definite only as long as its properties all remain constant from specimen to specimen. But multiplying species because of slight differences in chemical or physical properties can be much overdone, and there is a practical limit to the number and difficulty of the tests which must be applied to identify a specimen.

A vote of thanks was tendered the speaker for his interesting address.

Messrs. Arndt and Boyle reported on a trip taken on May 29, 30, and 31 by nine members to the old chromite mines on the Pa.-Md. border in southern Chester and Lancaster Counties, Pa. Kämmererite, talc, colerainite, brucite, genthite, zaratite, penninite, chromite, and precious serpentine were some of the minerals found. Mr. Cienkowski reported on a trip taken with some students from the Philadelphia Northeast High School to the French Creek Mines on the same dates. Crystalline apophyllite, pyrite, and calcite were obtained. Many specimens from both trips were exhibited.

HORACE R. BLANK, *Secretary*

BOOK REVIEWS

THE STORY OF THE MINERALS. HERBERT P. WHITLOCK

AMERICAN MUSEUM OF NATURAL HISTORY, HANDBOOK SERIES NO. 12, 1925, 144 pages, with colored frontispiece and numerous line drawings and half-tone illustrations.

This little book aims to answer in simple language some of the many questions constantly asked about minerals by museum visitors. It consists of two parts, in

the first of which the following topics are discussed: History and Sources of the Mineral Collection, What is a Mineral, Nature's Mathematics, The Mimicry of Minerals, Water as a Maker of Minerals, and Change and Decay in Minerals. Part two contains very general descriptions of the more important minerals, constant reference being made to specimens in Morgan Memorial Hall. The book is well printed and illustrated. It should prove very serviceable to those seeking an elementary knowledge of minerals.

E. H. KRAUS

A CONTRIBUTION TO THE MINERALOGY OF NEW SOUTH WALES. GEORGE SMITH. MINERAL RESOURCES NO. 34, Department of Mines, Geological Survey, Sydney, Australia, 1926. (3s. 3d.) 145 pages, 31 plates, 9 text figures and 1 map.

The author of this bulletin has had unusual opportunities to observe first hand the mineral occurrences and associations in this region. These exceptional advantages were due to his long period of service in N.S.W.; first as ore buyer and assayer, then as mine manager and for the past twenty-one years as Inspector of Mines.

The major portion of this bulletin, namely 103 pages (Part 1), is devoted to Descriptive Mineralogy, in which about 147 mineral species are described. No mineral is included that has not been actually observed by the author during his thirty-seven years of mineralogical activity. The arrangement of the minerals is essentially that used by Dana in his System.

Part II discusses the Mineralogy of the Broken Hill and the A.B.H. Consols lodes. Here emphasis is placed upon the variations of mineral composition in the oxidized zone (especially in the Broken Hill lode) and the deposition of silver sulfides from descending solutions (Consols lode). Appendices contain chapters on the occurrence of cassiterite, molybdenite and wolframite. A map of the Barrier District is also included.

This bulletin represents the most comprehensive general treatise on the minerals and their associations of New South Wales that has appeared in recent years and should be of unusual interest to both mineralogist and engineer.

W.F.H.

NEW MINERAL NAMES

Buttgenbachite

ALFRED SCHOEP: Sur la buttgenbach, Nouveau Minéral. (Buttgenbach, a new mineral). *Compt. Rend.*, **181**, 421 (1925).

NAME: In honor of H. Buttgenbach, Professor of Mineralogy at the University of Liege.

CHEMICAL PROPERTIES: A hydrous chloro-nitrate of copper. Formula; $18 \text{ CuO} \cdot 3 \text{ Cl} \cdot \text{N}_2\text{O}_6 \cdot 19\text{H}_2\text{O}$. Analysis: H_2O 17.34, CuO 71.56, Cl 6.02, N_2O_6 5.40; Sum $100.32 - \text{O} = \text{Cl}$ 1.28; 99.04. Soluble in acids.

PHYSICAL AND OPTICAL PROPERTIES: Color azure blue, non-pleochroic. Streak blue. Extinction parallel, elongation negative. Birefringence very feeble. n along the needles = 1.747; across them slightly less. Sp. Gr. 3.33.

OCCURRENCE: Found as flat needles about 1 mm. in length in a cavity in cuprite associated with native silver at Likasi, Belgian Congo.

W. F. FOSHAG

Cornuite

F. V. v. Hahn: Cornuite, ein neues proteinartiges Mineral aus der Kieselguhr von Neu-Ohe). *Centr. Min. Geol.*, 353 (1925).

NAME: In honor of Felix Cornu, the Austrian mineralogist.

CHEMICAL PROPERTIES: A protein-like gel. Dry protein 3 percent, insol. 0.08, water 97. Gives protein reaction with Biuret, Heller, Abderhalden, Xantho-protein and Cystin tests.

PHYSICAL PROPERTIES: Color golden-yellow. Typically a gel in structure.

OCCURRENCE: Found in small cracks in the diatomaceous earth at Neu-Ohe, in the Lüneburger Heide, Prussia.

DISCUSSION: (The name cornuite has been given to the amorphous silicate of copper. Abstr.).

W. F. F.

Fluotaramite

(See Taramite)

J. MOROZEWICZ: *Tsch. Min. Pet. Mitt.*, 38, 213-222 (1925).

NAME: In reference to its composition; a fluorine bearing taramite.

CHEMICAL PROPERTIES: A fluorine bearing iron-alkali amphibole. Analysis: SiO_2 52.59, TiO_2 0.91, Al_2O_3 1.64, Fe_2O_3 7.69, FeO 11.80, MnO 0.60, CaO 3.41, MgO 9.32, K_2O 2.06, Na_2O 6.79, F_2 2.05, H_2O (+105°) 1.44, H_2O (-105°) 0.34. Sum 100.64; -0 = F_2 0.86; 99.78. Two other analyses given. Insoluble in hydrochloric acid.

PHYSICAL AND OPTICAL PROPERTIES: Color black with tinge of green. Plane of the optic axes normal to (010). $c' \wedge X = 12-15^\circ$. Dispersion $\rho > \nu$. $\gamma > 1.657$, $\alpha = 1.657$. Pleochroism strong. X=bluish green; Y=yellowish; Z=dark green. Sp. Gr. 3.231-3.318.

OCCURRENCE: Found as long, needle-like crystals in pegmatites in the Walitarama Valley, near Mariupol, Ukraine.

W. F. F.

Magnetoplumbite

G. AMINOFF: Über ein neues oxydisches Mineral aus Långban (Magnetoplumbite). (A new oxide mineral from Långban: Magnetoplumbite). *Geol. För. Förh. Stockh.*, 47, 283-289 (1925).

NAME: In allusion to its composition; a magnetic oxide of iron and lead.

CHEMICAL COMPOSITION: An oxide of iron, manganese and lead: $2\text{RO} \cdot 3\text{R}_2\text{O}_3$. Analysis: PbO 19.74, TiO_2 4.84, Fe_2O_3 54.65, Al_2O_3 0.88, Cr_2O_3 0.05, MnO 17.33, CaO 0.35, MgO 0.47, K_2O 0.14, Na_2O 0.16, H_2O 0.26, SiO_2 0.15, insol. 0.52. Sum 99.52. Difficultly soluble in HCl with slight evolution of Cl_2 .

CRYSTALLOGRAPHIC PROPERTIES: HEXAGONAL; $c = 3.91$. (0001): $(10\bar{1}1) = 77^\circ 31'$. Class D_{6h} . $c = 23.69 \text{ \AA}$; $a = 6.06 \text{ \AA}$.

PHYSICAL PROPERTIES: Color black, streak dark brown. Luster metallic. Cleavage basal, good. Strongly magnetic. Sp. Gr. 5.517.

OCCURRENCE: Found in the America stope in a manganophyllite skarn associated with kentrolite, a mineral similar to hedyphane and another similar to berzeliite.

DISCUSSION: Plumboferite has the ratios $\text{PbO} \cdot 2\text{Fe}_2\text{O}_3$ and is non-magnetic and hence differs from magnetoplumbite.

W. F. F.

Pumpellyite

PUMPELLYITE, a new mineral. Charles Palache and Helen E. Vassar. *American Mineralogist*, **10**, 412-415 (1925).

The new mineral name Pumpellyite refers to a zoisite-like mineral of the composition $6\text{CaO} \cdot 3\text{Al}_2\text{O}_3 \cdot 7\text{SiO}_2 \cdot 4\text{H}_2\text{O}$. According to the authors this mineral has previously been called "green earth" and was probably often mistaken for chlorite. It has been called to the abstracter's attention that in the early reports on the Keweenawan series of Michigan, A. C. Lane¹ briefly describes this mineral as zoisitic epidote.

W. F. F.

Quenselite

GUST. FLINK: Quenselite, ein neues Mineral von Långban. (Quenselite, a new mineral from Långban). *Geol. För. Förh. Stockh.*, **47**, 377-384 (1925).

NAME: In honor of Prof. Percy Quensel, Swedish mineralogist.

CHEMICAL COMPOSITION: A hydrous manganite of lead: $2\text{PbO} \cdot \text{Mn}_2\text{O}_3 \cdot \text{H}_2\text{O}$. Analysis: PbO 69.51, Fe_2O_3 0.39, MnO 23.21, CaO 0.97, MgO 0.30, K_2O 0.17, Na_2O 0.28, CO_2 0.64, O 2.38, H_2O 3.02. Sum 100.87 (on sample contaminated with some calcite and iron oxide). Soluble in dilute acids including acetic acid. With HCl evolves Cl_2 . Upon heating loses water.

CRYSTALLOGRAPHIC PROPERTIES: Monoclinic, $a : b : c = 0.9767 : 1 : 1.667$. $\beta = 93^\circ 6'$. $(100) : (001) = 86^\circ 54'$. $(110) : (010) = 45^\circ 43'$. $(011) : (001) = 59^\circ$.

PHYSICAL PROPERTIES: Color pitch black. Luster metallic to adamantine. Opaque. Streak dark brownish gray. Cleavage basal, perfect; somewhat micaceous. Somewhat malleable. Hd 2.5 Sp. gr. 6.842.

OCCURRENCE: Found in the America Stope at Långban at a depth of 185 meters in iron ore associated with calcite and barite.

DISCUSSION: Quenselite is the only basic manganite now known.

W. F. F.

Reniforite

KEIKICHI KAWAI: A new mineral, Reniforite, from the Yunosawe Mine in the Province of Mutsu, Japan. (Japanese). *Jour. Geol. Soc. Tokyo*, **32**, 106-116 (1925). Abstract in Japanese. *Jour. Geol. Geog.*, **3**, 15 (1924).

CHEMICAL COMPOSITION: A sulpharsenide of lead: $5\text{PbS} \cdot \text{As}_2\text{S}_3$. Analysis: S 19.44, As 10.32, Pb 69.56, Fe 0.45. Sum 99.77.

PHYSICAL PROPERTIES: Luster metallic, Sp. Gr. 6.451.

OCCURRENCE: As reniform aggregates associated with barite.

H. S. WASHINGTON

Silesite

(See Bolivianite, *Am. Mineral.*, **11**, p. 194)

ANTONIO PAULY: *Centr. Min. Geol.*, 44-45 (1926).

NAME: After the President of Bolivia. Hernando Siles.

CHEMICAL COMPOSITION: A silicate of tin. Sn about 55 percent.

PHYSICAL AND OPTICAL PROPERTIES: Color light yellow. Sp. Gr. 5 Hd 6.

¹ *Bull. Geol. Surv. Michigan*, Vol. VI, Pt. 1, pp. 166, 127 and 157 (1911).

OCCURRENCE: Found as fine grained, horny to fibrous aggregates similar to chalcedony in the upper portions of the tin veins of Bolivia. Probably a gel.

DISCUSSION: (Very probably an intimate mixture of wood, tin, and silica. Abstr.).

W. F. F.

Taramite

(See *Fluotaramite*)

J. MOROZEWICZ: Über einige Eisenalkali-amphibole. (Concerning several iron-alkali amphiboles). *Tsch. Min. Pet. Mitt.*, **38**, 210–222 (1925).

NAME: From the locality Wali-tarama Valley near Mariupol, Russia (Ukraine).

CHEMICAL PROPERTIES: An amphibole rich in iron and alkalies. SiO_2 37.51, TiO_2 0.73, Al_2O_3 8.50, Fe_2O_3 11.41, FeO 23.21, MnO 1.70, CaO 7.91, MgO 0.56, K_2O 2.10, Na_2O 3.79, F_2 0.14, H_2O (+105°) 2.32, H_2O (–105°) 0.33. Sum 100.21; $-\text{O} = \text{F}_2 0.06$; 100.15. An analysis of another sample is also given. Soluble in hydrochloric acid.

PHYSICAL AND OPTICAL PROPERTIES: Color black with a tinge of blue. Plane of the optic axes is normal to (010). Extinction on (010), $c \wedge Y = 14^\circ$ (red), 15° (yellow), 18° (violet). Dispersion strong, $\rho > v$. n is greater than 1.656, $2V$ small, almost 0. Pleochroism strong, X =pale yellow; Y =bluish green; Z =dark green to black. Sp. Gr. 3.476.

OCCURRENCE: Found in alkali-syenite associated with granites as short prismatic crystals, at Wali-tarama, near Mariupol, Ukraine, Russia.

W. F. F.

Ulrichite

GERARD KIRSCH: Über die Zusammensetzung der Pechblenden. (Concerning the composition of pitchblende). *Tsch. Min. Pet. Mitt.*, **38**, 227 (1925).

NAME: In honor of C. Ulrich, Austrian mining engineer.

CHEMICAL PROPERTIES: Essentially an oxide of uranium, UO_2 but with some UO_3 , PbO , etc., as a result of radio-active metamorphism.

CRYSTALLOGRAPHIC PROPERTIES: Isometric, with the forms (111), (100), and (110).

PHYSICAL AND OPTICAL PROPERTIES: Color pitch black to grayish black. Streak brownish black to black. Luster submetallic. Almost opaque, thin splinters brown on the edges under the microscope. Fracture uneven to smooth. Hd 6. Sp. Gr. 7.5–11.

DISCUSSION: Kirsch divides pitchblende into two classes: (1) Crystallized and characterized by a high UO_2 content and (2) non-crystallized and with a UO_2/UO_3 ratio about 1. Class 1 is considered an oxide, class 3, uranate. To class 1 belong cleveite and nivenite, rich in rare earths and bröggerite, rich in thorium. The name ulrichite is proposed for the essentially pure UO_2 but may carry considerable amounts of UO_3 and PbO as a result of radio active metamorphism. The Branchville Connecticut pitchblende is given as typical ulrichite.

W. F. F.

Warthaite

JÓZSEF KRENNER: Warthaite, a new mineral from Hungary. *Math. Termés. Ert.*, **42**, 4–5 (1926).

CHEMICAL PROPERTIES: A bismuth sulphosalt of lead 4 (Pb , Cu , Ag) S . Bi_2S_3 . Analysis: Bi 28.18, As tr., Pb 54.53, Ag 1.01, Cu 1.05, Fe 0.17, S 15.31.

PHYSICAL PROPERTIES: Color steel gray. Luster metallic.

OCCURRENCE: Found as radially fibrous bundles in crystalline limestone associated with sphalerite, pyrite and hematite.

DISCUSSION: (Apparently the same as goongarrite.) Cf. *Amer. Mineralogist* 10, 39 (1925).

W. F. F.

NOTES AND NEWS

The Mineralogical Society sustained a severe loss in the death on July 21 of Colonel Washington A. Roebling of Trenton, New Jersey. While Col. Roebling had acquired an international reputation as an engineer, he had many accomplishments. He first became interested in mineralogy through a course in blowpipe analysis that he elected while a student at Rensselaer Polytechnical Institute. His interest in minerals and desire to possess them never waned and resulted in the acquisition of a very remarkable private collection that now numbers over 16,000 specimens. Col. Roebling was an honorary member of the New York Mineralogical Club, the Philadelphia Mineralogical Society, and a life fellow of the Mineralogical Society of America. Shortly before his death he gave the Society a substantial endowment, the income of which is being used for the publication of mineralogical research. A memorial sketch of the life of Colonel Roebling and a description of his unusual collection of minerals will appear in a later issue of *The American Mineralogist*.